FOSSIL BIRDS FROM THE QUATERNARY OF SOUTHERN CALIFORNIA

By LOYE HOLMES MILLER

PROBABLY no more unique or interesting deposit of vertebrate fossils was ever made known to science than the Quaternary beds recently designated by Dr. J. C. Merriam "The Rancho La Brea Formation." Almost certainly no deposit of similar area has yielded greater numbers of that group so sparingly preserved to the paleontologist—the class Aves.

Ten miles west from the center of Los Angeles, California, the great acreage of Rancho La Brea, one time grain and stock ranch, has within a decade or so assumed a new value. The evidence exposed there from Quaternary time has recently been interpreted and a forest of oil derricks has sprung up, to yield a million dollars' worth of oil annually. But the particular kind of evidence indicating the deep-lying oil strata becomes of interest to the scientist because of its long exposure and the fact that man was not the only animal persistently heedless of its true nature. The heavy asphalt-bearing oil, forced to the surface thru overlying strata, accumulated in the natural depressions as small lakelets of oil which, as the more volatile constituents evaporated, became masses of plastic and marvelously tenaceous, tar-like substance.

These tar-pools, when undisturbed, possess the mirror-like surface of water and, especially at night or in the half light of dusk, would readily be mistaken for such; yet the bird whose wing-tip touches the innocent looking surface, or whose foot plashes into its margin, is as surely doomed as tho caught in the jaws of a more active enemy. In rainy season the depression becomes further filled by the addition of a super-stratum of water which may cover the tar surface to a depth of several inches, remaining fairly pure water for some time before it becomes polluted by the rise of the lighter constituents of the oil layer. Animals, small and large, wade rashly into the treacherous trap thus baited with that rare luxury of the region, water. The struggling victim becomes again bait for the predatory forms and all in turn tempt the final captive, the carrion feeder.

Today, as in ages past, the trap is at work. Barn Owls, Great Blue Herons, Meadowlarks and other birds have been noticed in the surface pools, still in the flesh.

The tar pools of Quaternary time have been by the slow process of natural distillation, converted into masses of stiff asphalt seamed here and there by softer seepage cracks like the resin pockets of raw pine timber. This matrix is quite preservative and fairly easy to work, and specimens taken from these beds are easily cleaned with gasoline, tho they retain the dark discoloration of the asphalt. It has been the writer's privilege thru the courtesy of the ranch owners, to collect somewhat in this interesting locality. Also the whole of the bird material in the collections of the University of California has been placed at his disposal by Professor Merriam for careful examination. The task of describing this great mass of material is little more than begun, but enough has been determined to show the importance of the field.

Two papers descriptive of three new species of birds were publisht in the University Press [1]. To these the reader is referred for detailed descriptions; the aim here is to present some of the points of more general interest.

Much has been said of the remarkable mammalian forms of the Quaternary, remarkable no more for peculiarity of form than for peculiarity of distribution as

1 Publ. Univ. Calif., Geology, vol. 5, nos. 19 & 20.

regards mammals of today. In the asphalt of Rancho La Brea there have been found the gigantic ground sloth, the saber-tootht tiger, camel-like forms, the great mastodon and the extinct Pacific horse. If such changes have been wrought in the mammalian fauna of the region, what may we not look for among birds? The antiquity of the group precludes the likelihood of discovering in the Quaternary, any form which might be considered as ancestral. The interest of expectancy then centers in the main in questions of distribution and in the occurrence of unusual extinct forms. The following is a list of species thus far identified, with the number of individuals of each found in a certain un-assorted part of the University collection.

Gymnogyps californianus. California Condor, 11
Catharista occidentalis. Western Black Vulture, 21
Cathartes aura. Turkey Vulture, 20
Aquila chrysaetos. Golden Eagle, 33
Buteo borealis. Red-tailed Hawk, 8
Indeterminate buteonid, 3
Indeterminate falconid, 4
Circus hudsonius. Marsh Hawk, 3
Aluco pratincola. Barn Owl, 2
Asio. Long-eared Owl, 2
Asio accipitrinus. Short-eared Owl, 2
Speotyto. Burrowing Owl (?), 2
Bubo virginianus. Great Horned Owl, 1
Anser. sp.? Brant, 1
Branta. Canada Goose ?, 1
Ardea herodias. Great Blue Heron, 1
Indeterminate Stork, 4
Grus. Indeterminate Crane, 2
Indeterminate Pheasant, 5
Pavo californicus. California Peacock, 6
Corvus corax. Raven, 2
Teratornis merriami, 6

Owing to the conditions under which the specimens were entombed, this list does not represent the balanced avifauna that probably existed in the region at the time. Three classes will be notist to predominate—predaceous or scavenging forms, water birds, and ground dwellers. Of these three, the first shows the greatest number of species as well as individuals. An explanation of this anomalous condition was offered in the second of the papers referred to above (vol. 5, no. 20). I transcribe as follows:

"The large preponderance of raptorial species will at once be noted in this list. * * * A similar relation between predaceous and non-predaceous species is noted by Professor Merriam [2] among mammals from this formation. Numerous writers on the Golden Eagle as it exists today have commented on the carrion habit of the species. Its abundant occurrence in the asphalt trap of Rancho La Brea bears evidence of the long standing of the habit of preying upon either dead or disabled animals. The specimens average large and possibly represent birds in old age. The left tarsus of one individual shows an abundant exostosis due to some diseased condition which caused the loss of the entire foot. Merriam noted among mammals a preponderance of young individuals accompanied in the case of

2 Merriam, J. C., Science, N. S., vol. 24, p. 248; 1906.

carnivores by a large number of individuals with worn or broken teeth. He ascribed this condition to the inexperience of the young or to the extremity of the aged. Possibly among predaceous birds, cared for in infancy and taught by instnct to seek an active prey not perceived by the sense of smell, it was mainly the old or otherwise disabled individuals which resorted to this ignoble feast."

The absence of small passerines is perhaps explainable by their possible destruction during a certain degree of differential motion of which these beds give evidence. The struggle of the larger mammals entrapt, the slow sinking of their carcases, the upward counter-current produced by the rise of gas bubbles or of semi-liquid material, all conspired to effect a pretty thoro churning which resulted in the breaking of mammalian bones of considerable size. Recent passerines are certainly not infrequent victims of the deceptive asphalt. Their bones in matted masses were found in a recent deposit. Their bodies still in the flesh have been noted as stated above. A workman in the oil fields told me that he once counted the dead bodies of seventy-five swallows that had come to gather "mud" on the margin of an oil reservoir built by the levee of a natural depression. On the streets of Berkeley, California, during the past summer, the street railway company spread a thin layer of crude oil late one afternoon. The next morning at eight o'clock, the author saw an English Sparrow that had fallen victim—feet, wings, breast, feathers and finally nostrils, completely smeared with the viscid oil.

Interesting records bearing on the range of present species have been made in several cases. The discovery of a true Peacock is perhaps the most startling. Mr. Grinnell in a very charitable review of the author's paper on this form, has already called attention of CONDOR readers to the instance. Another case is that of *Catharista occidentalis*, a new vulture slightly larger than *C. atrata*, with different proportions in the limb segments. The interesting question of the southward and eastward range of the new form next presents itself, truly an almost hopeless task, it seems, in view of the rarity of avian fossils. Other cases of equal or greater interest will doubtless come to light as the work progresses.

The distal end of a tibia in the collection shows that a Caracara (*Polyborus*) was a member of our fauna at that time, tho specific determination has not yet been accomplisht. A Stork larger than the Wood Ibis (*Tantalus*) further allied us with the present Mexican or tropical American fauna. What could be more logical in view of the relation of Quaternary mammals to the present South American fauna? During Quaternary time the physiographical barriers between North and South America are considered to have been less complete than those at present existing. Thus a blending of mammalian faunas of the Quaternary was permitted. Will enough other semi-tropic avian species be found with *Catharista* and *Polyborus* to indicate the absence at that time of climatic barriers or climatic differences? Has a gradual change in the climate of southern California caused a recession southward of the ranges of the two genera *Polyborus* and *Catharista*?

The search for the unusual has been rewarded to the full in the new form *Teratornis*. This form is striking to the layman as well as to the ornithologist. Eagle-like in its contours, unquestionably a bird of raptorial habit at least, yet it has a brain case exceeding in width that of the Ostrich, and is armed with a comprest, hookt beak almost twice the depth of that of a large female of the Alaska Bald Eagle. If the association of body parts found with the skull be correct, and every evidence points to the propriety of such assumption, the bird was a flying bird, tho a sailing and not a flapping flier. The clavicles are less powerful in proportion than those of the Condor, but are far from being the weak structures seen in flight-

less birds. The characters of the sternum and the humerus suggest those of the sailing fliers.

Those California bird students who have seen the Condor towering above the Turkey Buzzards groupt about a carcass probably have a good mental picture of the way this great bird must have appeared among the Condors gathered about the vulture feast at the asphalt beds during Quaternary time.

ABNORMAL BIRDS' EGGS

By A. M. INGERSOLL

WITH FOUR PHOTOS BY THE AUTHOR

OOLOGICAL abnormalities are occasionally found by all collectors; but few, probably, have had the experience of examining a set of eggs showing such gradual variation in size as is illustrated in figure 7, accompanying this article. The seven eggs measure in inches, 1.06×.81, 1.04×.76, .96×.76, .93×.73, .84×.69, .82×.68, .81×.65. Each egg appeared to contain the usual proportionate amount of yolk. This Red-shafted Flicker, being inexperienced in nest building or too lazy to excavate a proper home, took possession of a large decayed-out hollow in an immense cottonwood tree. The entrance to this natural cavity was large

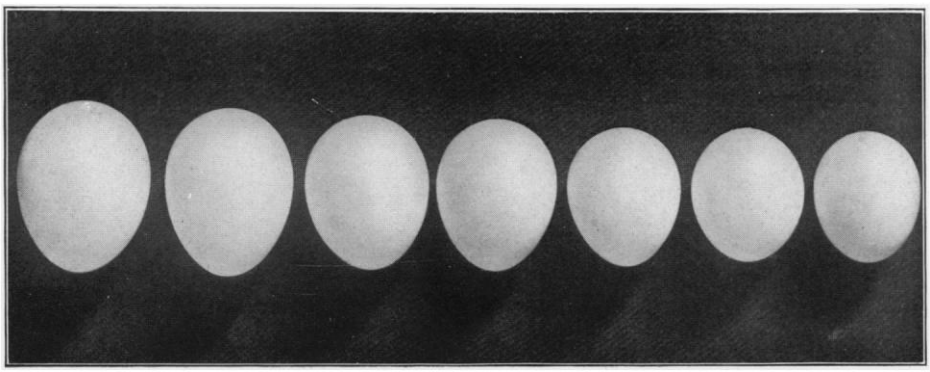

Fig. 7. SET OF SEVEN EGGS OF THE RED-SHAFTED FLICKER, COLLECTED AT RAMONA, CALIFORNIA, APRIL 25, 1888

enough to admit my head. This set of freaks were followed by eggs of normal size in the same nest.

Runts are commonly infertile. The yolk is generally present but sometimes much reduced in quantity and occasionally entirely lacking. Barring out species laying but a single egg to a set, I can only recall three instances in which a runt was positively the first egg deposited. It seems reasonable to believe such runts as are laid at the commencement of a set to be eggs of young birds, and those that are laid at completion of a set to be the final product of old birds on the verge of barrenness or enfeebled by excessive laying. I have never known of a set with runts, or such deformities as lopsided eggs, granulated shell texture, wrinkled or warty shell, to be followed by others containing similar abnormalities. This would seem to indicate that such malformations are not caused by a permanent individual peculiarity of the parent bird, as apparently is the case when certain individuals habitually lay eggs departing from normal in coloration, size or